European Commission

Connectivity and regional innovation

A. Rodríguez-Pose

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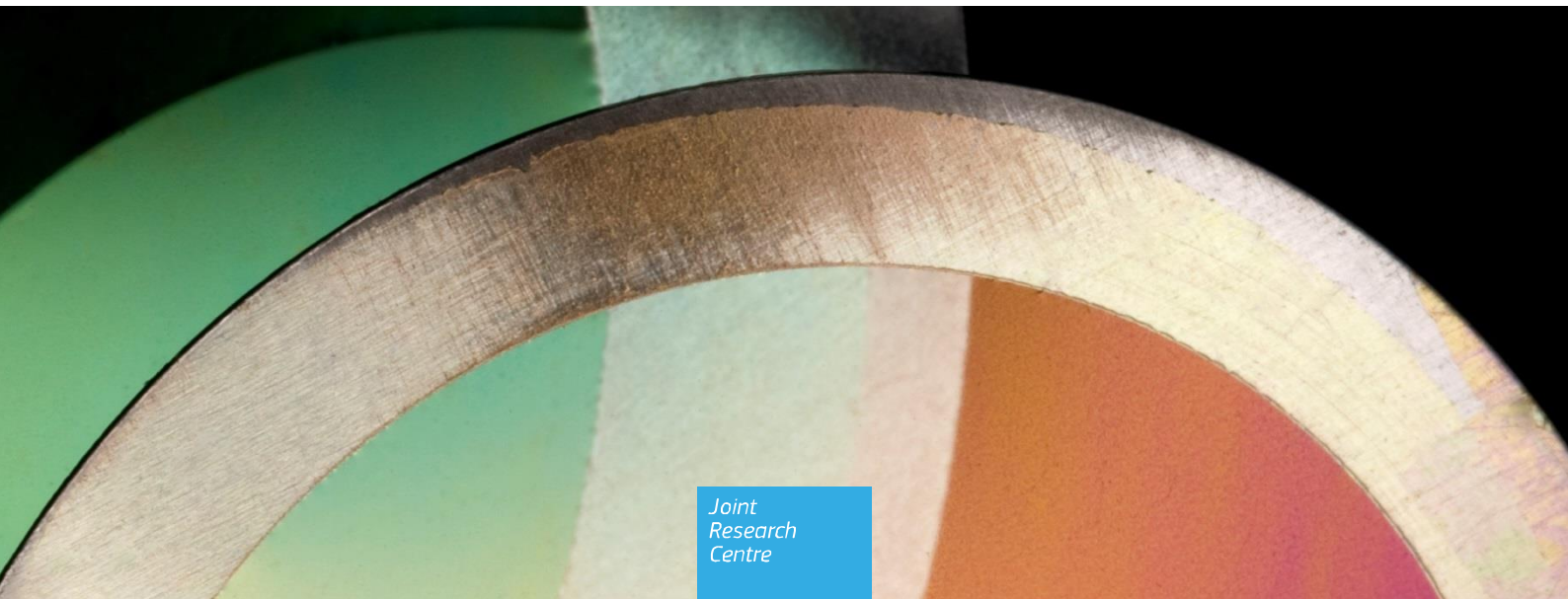

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Abstract

Connectivity plays a crucial role in the innovative capacity of firms, especially those located in less developed and remote areas. This paper explores the growing importance of connectivity and the establishment of purpose-built distant relationships as drivers of innovation in firms, particularly in regions far from dynamic innovation ecosystems. I argue that fostering partnerships and connections with firms, research centres, universities, consultancies, and other socio-economic actors, often located far away, can serve as catalysts for resilient innovation in remote and lagging areas and for unlocking their innovation potential. Policymakers need to design targeted strategies that promote collaboration and knowledge exchange, enabling firms in remote regions to overcome the tyranny of geographical distance and thrive, while, simultaneously, improving local conditions for the absorption of new knowledge and its transformation into economic activity.

Keywords: Connectivity, partnerships, innovation, remote areas, agglomeration effect, knowledge generation, knowledge spillovers, innovation ecosystems, innovation policies.

1 Introduction

Connectivity —understood as a capacity to establish knowledge linkages with the outside world— is playing an increasingly significant role in enhancing the innovative capacity of firms, particularly in less developed and remote areas. This paper aims to delve into the importance of establishing connections and cultivating purpose-built distant relationships as crucial drivers of innovation. It highlights the growing significance of these connections for firms, especially those situated far from the most dynamic innovation ecosystems. These connections serve as the most viable substitute, and sometimes even a complement, for the limited capacity to generate cutting-edge knowledge in areas facing considerable challenges in converting traditional research and development (R&D) investments into innovation.

I will argue that connectivity and the establishment of partnerships with firms, research centres, universities, consultancies, and other socio-economic actors, often located far away, act as catalysts for fostering resilient innovation in remote, lagging, and declining areas. The focus also extends to examining how this increasing connectivity contributes to the emergence of thriving innovation ecosystems and facilitates innovation catching-up between regions.

2 The agglomeration effect of big cities and innovation

In urban economics, it is well-established that research and innovation tend to concentrate in large cities (Glaeser, 2011). The concentration of innovative activities in these cities surpasses that of other economic phenomena such as economic growth, employment, or productivity (Carlino and Kerr, 2015).

Innovation often emerges from interactions and knowledge exchanges that occur more frequently when the actors involved in generating new knowledge have frequent opportunities to interact (Arora et al., 2001; Caloghirou et al., 2004; Freel and Harrison, 2006). Large and dense agglomerations offer advantages in facilitating such interactions. Physical proximity in large agglomerations enables a level of knowledge generation, diffusion, and assimilation that medium-sized cities, small cities, towns, and rural areas cannot replicate. Firstly, big cities attract skilled labour, drawing the best talent from neighbouring and distant areas (Glaeser, 1999; Bettencourt and West, 2011). Secondly, large cities host top universities and research centres that continuously produce talent, stimulating creativity and the generation of new ideas (Feldman, 1994; Florida, 2003). Additionally, the high density and co-location of firms in related and unrelated sectors, alongside universities and research centres, create what Storper and Venables (2004) refer to as the buzz of the city. This buzz represents the advantages of operating in a highly innovative and dynamic environment, where the constant exchange of ideas fuels new knowledge and innovation. The presence of dense labour markets in cities also fosters trust and social capital, facilitating the diffusion of knowledge (Fitjar and Rodríguez-Pose, 2011). Moreover, large agglomerations provide easier access to capital, essential for transforming knowledge into new ideas (Brugman, 2012).

Consequently, cities become laboratories where the constant interaction among individuals and firms, operating in similar or related sectors, promotes collaboration and competition, acting as a catalyst for the transfer of ideas, information, and most importantly, knowledge, which underpins innovation (Jacobs, 1961; Lee and Rodríguez-Pose, 2013). They are increasingly recognized as innovation machines (Florida et al., 2017), enabling firms located within them to access and assimilate an abundance and variety of knowledge that may not be available in locations lacking sufficient agglomeration economies (Carlino and Kerr, 2015).

Economic actors and firms located outside these large agglomerations are therefore disadvantaged in their capacity to innovate. Knowledge is inherently sticky and does not easily travel (Morgan, 2004), as knowledge spillovers are territorially bounded and subject to distance decay effects (Sonn and Storper, 2008; Rodríguez-Pose and Crescenzi, 2008). Economic actors and firms in smaller cities, towns, and rural areas also have limited access to tacit knowledge, which often requires face-to-face interaction that cannot be easily replicated through typical telecommunication channels (Storper and Venables, 2004).

Consequently, distance from potential collaborators presents a significant barrier for firms outside innovation hubs to innovate and grow.

3 Innovation in less densely populated areas, according to theory

If, according to most of scholarly research, innovation increasingly concentrates in large and dense agglomerations, how does innovation take place in less densely populated places? How do firms in medium-sized and small cities, towns, and rural areas innovate? Are they condemned to playing second fiddle to the more dynamic firms in knowledge and innovation hubs?

Firms and economic actors in smaller cities, towns, and rural areas are often considered less innovative due to the challenges posed by their location. These areas typically lack the human capital necessary for generating new knowledge. Limited educational options and fewer job opportunities compared to larger cities cause talented individuals to migrate away from these areas, either during higher education or after graduation in search of better prospects (Faggian and McCann, 2000; Biaggi et al., 2011). The weaker economic fabric of these regions —characterized by a smaller number of firms operating in less diverse environments— further limits their innovation potential. In essence, smaller and more distant places are seen as less capable of innovation due to a shortage of talent, weaker and more isolated firms, and a lack of innovation actors necessary for fostering exchanges and building trust, which are vital for innovation in larger agglomerations (Rodríguez-Pose and Fitjar, 2013). In summary, these areas lack the necessary agglomeration economies and face significant challenges in establishing the right institutions.

4 But can innovation take place in areas lacking agglomeration economies?

Existing research confirms, to a large extent, the idea that most new knowledge emerges and is transformed into innovation in large agglomerations (Glaeser, 2011; Carlino and Kerr, 2015; Florida et al., 2017). The gap between innovation in big cities and other geographical spaces is, therefore, widening (Carlino and Kerr, 2015; European Commission, 2020; Rodríguez-Pose, 2020). And yet, many firms in medium-sized and smaller cities as well as in less dense areas lacking economies of agglomeration remain not only dynamic. They are also innovative. Perhaps the most important innovation breakthrough in recent years —the ground-breaking BioNTech mRNA-based COVID-19 vaccine— was not the result of research conducted by very large pharmaceutical firms or world leading universities in the largest urban agglomerations. It was developed by BioNTech, a spin-off created by researchers of immigrant stock previously working at the University of Mainz. Mainz, a city of close to 220,000 inhabitants, host what according to the QS rankings 2024 is the 27th University in Germany and the 464th in the world. Additionally, two of Europe's most successful companies, Inditex and IKEA, trace their origins to either declining medium-sized cities or rural areas. Inditex, now one of the largest textile and apparel companies globally, was founded in Arteixo, a suburb of Corunna, a city of roughly 250,000 inhabitants in northwest Spain. IKEA, the world's largest furniture company, established its first store in Älmhult, a small town in southern Sweden, far from the country's three largest cities. Furthermore, numerous German hidden champions —leading small and medium-sized companies in specific sectors or technological niches worldwide— operate from medium-sized cities, small towns, or rural areas.

But, beyond this generally anecdotal evidence, there is increasing systematic research bringing to the fore the existence of highly innovative pockets of firms in areas that would normally be considered as innovation-averse environments (Rodríguez-Pose, 1999). Much of this work points towards the dynamism of many firms located in areas lacking economies of agglomeration across the Nordic countries. Whether it is in Sweden (Grillitsch and Nilsson, 2015), Norway (Fitjar and Rodríguez-Pose, 2011, 2020; Flåten et al., 2015), or Finland (Simonen and McCann, 2008), research has come to highlight the important role that connectivity with the outside world plays in pushing the innovativeness of firms that face the handicap of operating in potential to generate new knowledge is limited. Research conducted in Austria (Tödtling et al., 2011), Switzerland (Meili and Shearmur, 2019), or Canada (Doloreux et al., 2015) come to similar conclusions: innovation can happen outside large agglomerations, provided the economic actors in smaller and/or more remote locations use connectivity as a source of knowledge that then is circulated within sectors and industrial ecosystems in the periphery. In many of these countries, some towns and rural areas that have traditionally been considered as far less adept at generating and/or assimilating new knowledge and, as a consequence, far less able to innovate, are making significant inroads in producing dynamic and innovative businesses, increasing productivity, creating employment, and improving the livelihoods of their citizens.

5 Connectivity and innovation

Many firms in areas lacking economies of agglomeration suffer from an access to new knowledge deficit. Relying on knowledge flowing within the local or regional innovation system can lead to lock-in that limits their potential, as any knowledge flowing within the system has low related variety (Isaksen and Karlsen, 2016). In addition, strong bonding social capital may lead to entrapment in systems with little capacity to adapt and generate new dynamism. Lack of agglomeration economies and of a critical mass also reduces the ability to absorb knowledge flows and spillovers (Moreno et al., 2005; Sonn and Storper, 2008; Rodríguez-Pose and Crescenzi, 2008). Operating in closely-knit small clusters, decoupled from the outside world, can harm therefore the economic potential of its members.

So, how do firms in smaller/more remote areas innovate? The main solution to innovate is to break out of this lock-in and seek extra-local and extra-regional knowledge as the main way to diversify knowledge sources and then introduce it into the ecosystem, in general, and the firm, in particular. The presence of internal networks and organisational learning strategies can afterwards contribute to diffuse that new knowledge internally within existing clusters or systems of innovation (Isaksen and Karlsen, 2016). Exposure to outside firms, higher education institutions, research centres, or consultants —located often in distant places— can help develop new ideas, break routines, and push economic actors to move out of their comfort zones. Raising external connectivity is, first and foremost, a fundamental source of new knowledge. Exposure to external sources also raises the capacity to absorb new ideas and transform them into knowledge and innovation. This is particularly relevant in remote and/or rural contexts that are less capable of generating new knowledge by themselves. Hence, tapping into the knowledge and ideas being produced in innovation hubs —or, for that sake, anywhere that is relevant for the specific firm or economic actor— becomes crucial to make sure that economic actors operating outside agglomeration economies can overcome the tyranny of distance and compete with (or even outcompete) firms in innovation centres.

This requires connectivity. As highlighted by Grillitsch and Nilsson (2015), many innovative firms in small and/or remote locations to a certain extent compensate for their lack of agglomeration economies by putting the emphasis on connectivity. In a certain sense it can be considered a substitute for the lack of local capacities. Firms in smaller or more remote areas can overcome the limitations of their local or regional innovation systems by seeking extra-local and extra-regional knowledge. Connecting with external sources such as outside firms, higher education institutions, research centres, or consultants, allows firms to access new ideas, break routines, and expand their knowledge base. Greater connectivity not only benefits individual firms but also the entire local innovation system by increasing the amount and depth of innovation-driving knowledge in these areas, leading to the break-up of lock-in and promoting resilience in innovation (Grillitsch and Nilsson, 2015). However, given the importance of co-location and trust for innovation and the development of economic activities, it may also be the case that connectivity alone may not help overcome the potential benefits of co-location for trust-based economic processes, such as the financing of innovation. The importance of specific local capacities and local ecosystems for the development and/or absorption of some types of knowledge can, nevertheless, not always be easily substituted by connectivity, as the uptake of new knowledge depends very much on firm and regional characteristics (Eder and Trippl, 2019). Hence, there is a need for caution, as “in a knowledge production context [...] agglomeration and scientific networking are neither substitutes nor complements but operate at distinct parts of the knowledge production process” (Varga et al., 2014: 229).

6 Connectivity and sustainability

Another issue related to connectivity is that of how sustainable it can become in remote areas. Connectivity plays a crucial role in promoting the economic sustainability of these areas by facilitating knowledge exchange, collaboration, and innovation. Enhanced connectivity enables the establishment of partnerships between firms, research centres, and other actors located in different regions. These connections act as catalysts for resilient innovation in such areas, helping them overcome challenges related to limited access to cutting-edge knowledge and weak innovation ecosystems. Through connectivity, firms in remote areas can engage in knowledge sharing, leverage external expertise, and contribute to sustainability-oriented development policies (Fitjar and Rodríguez-Pose, 2011; Eder, 2019; Shearmur, 2012).

Furthermore, connectivity encompasses more than knowledge exchange and collaboration. Digital technologies, such as the Internet, play a significant role in enhancing connectivity and driving sustainable development (Nevado-Peña et al., 2019). They have the potential to facilitate access to education, healthcare, sustainable farming practices, and decent work opportunities. By bridging the digital divide and ensuring inclusive access to digital tools and services, technology can contribute to a more equitable and interconnected world. Connectivity also serves as the foundation for innovation, mobilizing partnerships and leveraging the potential of new technologies to foster progress. Sustainable mobility initiatives, enabled by connectivity, promote efficient transportation systems, reduce emissions, and improve access to essential services, thereby contributing to the achievement of sustainable development goals (Bianchini et al., 2023).

It is in the context of remote communities that connectivity holds particular relevance but also where the concerns about the sustainability of its impact on innovation are greater. Rural and remote areas often face challenges related to geographical isolation and accessibility —including limited transport connections— which can result in lack of capacity to attract and absorb knowledge and, ultimately, in economic stagnation and backwardness. State support and policy interventions are essential in ensuring access to public services and addressing these challenges. Connectivity plays a vital role in linking remote communities to crucial services such as healthcare, agriculture, education, and employment opportunities. It enables the development of transport infrastructure and the implementation of innovative solutions to enhance connectivity in remote regions (Fageda et al., 2018).

Still, connectivity entails more than just having the means to connect. Physical connectivity alone does not equate to full participation in global production networks or value chains; it may enable such participation, but it does not necessarily signify the capacity to connect on its own. While having reliable access to the Internet and to fast broadband facilitates and reduces the cost of connectivity, it does not trigger connectivity per se. Connecting to the outside world fundamentally requires other types of proximity as well, such as cognitive, organisational, social, and institutional proximity (Boschma, 2005).

Boschma's (2005) seminal contribution —embedded, in turn, in the ideas of the French School of Proximity (e.g., Rallet and Torre, 1999; Torre and Rallet, 2005)— underlines that physical proximity is not sufficient for the diffusion of knowledge and, consequently, innovation to take place. Having a social, cognitive, institutional, or organisational proximity is far more fundamental to create the necessary linkages for knowledge to flow and be absorbed by economic actors, including firms. Hence, firms located away from innovation hubs can compensate for the lack of physical access to knowledge in large agglomerations by increasing their 'softer' types of connectivity to the outside world (Grillitsch and Nilsson, 2015). This connectivity explains the ability of firms in relatively remote or lagging areas to remain innovative and highlights the resilience of innovation in areas with less favourable conditions. Greater soft connectivity benefits not only participating firms but also the entire local innovation system, as these firms act as gateways, diffusing knowledge through local networks. Consequently, there is an increase in the amount and depth of innovation-driving knowledge in these areas, breaking the lock-in often observed in relatively isolated clusters.

Connectivity is crucial for relatively isolated firms and economic actors to identify knowledge sources, access that knowledge, absorb it, and transform it into innovation. The absorption and transformation of knowledge into innovation are greatly facilitated by the presence of favourable territorial conditions, including skilled human resources, a robust economic ecosystem, and efficient institutions (Rodríguez-Pose and di Cataldo, 2015; Mascarini et al., 2023). Thus, connectivity, or the formation of extra-local pipelines as suggested by Bathelt et al. (2004), can drive innovation but necessitates significant resources from economic actors for its generation and maintenance. These resources encompass factors such as adequate human capital to absorb new knowledge and the open-mindedness of managers and workers within the firm. Increased open-mindedness at the firm level aids in identifying bottlenecks and motivates firms to seek solutions from external environments (Fitjar and Rodríguez-Pose, 2014). Cultural barriers can hinder access to the vital

knowledge at the foundation of firm-level innovation, as they undermine the necessary open-mindedness required to accomplish these tasks (Hernández-Mogollón et al., 2010).

Firms in disadvantaged areas can thrive despite the absence of agglomeration economies if they can connect with sources of new knowledge in the outside world. This facilitates learning, assimilation of new ideas, and the establishment of enduring relationships that drive the competitiveness of these actors. However, forging such linkages requires considerable effort and typically acts as a substitute rather than a complement to pursuing in-house innovation solutions (Haus-Reve et al., 2019).

7 Towards more innovative peripheries

Europe and most of its member countries are losing economic opportunities and their citizens seeing their well-being threatened because the continent is not firing on all cylinders in terms of innovation. The increasing concentration of innovation in a few large agglomerations is a sign of the mounting requirements in terms of human capital, R&D investment, and agglomeration economies that are needed to innovate nowadays. While this concentration of innovation may spur the overall competitiveness of Europe, it also has a dark side: the relative decay of many areas of Europe that, in some cases, had been hotbeds of innovation in the past or that, in others, despite historically lagging behind, may perform better in terms of the innovative capacity of their firms than they are currently doing.

It is crucial to tap into the innovation potential of these areas. However, existing innovation policies, both at the European and national levels, are inadequate for promoting firm-level innovation in these regions. Despite the challenges faced by firms in these areas, empirical research has demonstrated that many innovative companies emerge from what might be considered innovation-averse ecosystems. This innovation predominantly occurs when firms in these regions actively engage with the outside world and seek collaborative partnerships to address innovation obstacles within their organizations. By doing so, they can somewhat compensate for the relative lack of new knowledge in their local environments. These external partnerships can take various forms, including business-to-business relationships, collaborations with research institutions, consultants, or even competitiveness clusters. Increasing connectivity is arguably the most effective and viable means of introducing new ideas and knowledge to firms in these areas that would otherwise have limited opportunities for innovation.

However, simply enhancing connectivity may not be sufficient to fully leverage the generated knowledge unless it is complemented by strategies that enable local firms to effectively absorb and transform this knowledge into innovation. This requires a balanced approach that combines efforts to seek knowledge outside medium-sized and small cities, towns, and rural areas with a greater focus on developing local human capital and improving the quality of local institutions. Only through such a comprehensive approach can the full innovation potential of these regions be realized.

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